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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,287	06/05/2001	Tomio Sugiyama	2635-16	4759
23117	7590	04/01/2005	EXAMINER	
NIXON & VANDERHYE, PC			OLSEN, KAJ K	
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ARLINGTON, VA 22201-4714			1753	

DATE MAILED: 04/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/873,287

Applicant(s)

SUGIYAMA, TOMIO

Examiner

Kaj K Olsen

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada (USP 5,288,389) with or without the further evidence by Fujishiro et al (USP 4,105,524). Both references are being cited and relied on for the first time with this office action.

3. Yamada discloses a multilayered gas sensing element for incorporation into a gas sensor installed in an exhaust system of an internal combustion engine, the multilayered gas sensing element comprising laminated layers comprising an least one solid electrolyte sheet (3, 10) containing zirconia and yttria and at least one insulating sheet (20, 22) containing alumina. See fig. 2 and 3 and col. 5, line 51 through col. 6, line 8. With respect to the presence of the bonding boundary including at least partly a crystal phase containing silicon dioxide, the present disclosure evidences that silicon dioxide adding to the electrolyte followed by subsequent sintering results in the set forth bonding boundary. See page 5, lines 5-17 of the specification. Yamada discloses adding silicon dioxide to the electrolyte as a baking adhesive and teaches subsequent sintering. See col. 5, lines 54 and 55 and col. 6, lines 4-8. Hence, the set forth structure and electrolyte composition of Yamada would inherently result in the set forth bonding boundary.

Art Unit: 1753

4. This is further evidenced by the teaching of Fujishiro, which states that oxides such as SiO₂ in the electrolyte form a “secondary phase distinct from the solid solution phase of” the electrolyte and “exhibit strong affinity for the above metallic coatings”. See col. 5, lines 21-26. Hence it would appear that it was already known in the prior art that materials like SiO₂ form a phase distinct from the solid electrolyte phase on the surface of the electrolyte (i.e. where the electrodes of Fujishiro are) and assist in the bonding of layers to that electrolyte. This further evidences that the SiO₂ of Yamada would have inherently provided a bonding boundary containing crystal phase SiO₂ between the electrolyte and the insulating sheets.

5. With respect to claim 4, this would appear to be an inherent result of the adding SiO₂ to the electrolyte.

6. Claims 1, 2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueno (USP 4,650,560). Ueno is being cited and relied on for the first time with this office action.

7. Ueno discloses a multilayered gas sensor comprising a laminated layers comprising at least one electrolyte sheet 5 containing zirconia and yttria and an insulating sheet 23 containing alumina. See col. 5, lines 13-26. Ueno further discloses a bonding boundary (termed an “intermediate layer”) 21 intervening between the solid electrolyte sheet and the insulating sheet and this intervening layer includes SiO₂. See fig. 8, col. 5, lines 26-56 and claim 6.

Alternatively, the “bonding agent” of Ueno would also read on the specified bonding boundary. See col. 5, lines 45-56. The examiners notes that the “SiO” referred to in col. 5 would appear to be either a typo or shorthand for --SiO₂-- in view of claim 6 and the fact that there is no such material as SiO (i.e. silicon would only combine with oxygen in the +4 oxidation state). With

Art Unit: 1753

respect to this bonding boundary being partly a crystal phase, it is made primarily of crystalline materials like ZrO₂ and Al₂O₃.

8. With respect to claim 2, the bonding boundary also contains MgO.

9. With respect to claim 4, this would appear to be an inherent property of the bonding boundary of Ueno.

Claim Rejections - 35 USC § 103

10. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada in view of Esper et al (USP 4,183,798). Esper has been previously cited, but not previously relied on.

12. Yamada set forth all the limitations of the claim, but did not explicitly specify the presence of any of the set forth metal oxides. Esper teaches in an alternate electrolyte that a combination of stabilizing agents CaO and Y₂O₃ provides a desired specific resistance at a particularly low temperature. See col. 2, lines 10-17. This combination of CaO and Y₂O₃ would meet the “yttria” requirement of claim 1 and the presence of CaO of claim 2 as evidenced by Fujishiro, which disclosed that CaO and SiO₂ would inherently form a bonding boundary of CaO and SiO₂ (see discussion above). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Esper for the sensing element of Yamada in order to reduce the temperature needed to arrive at a desired specific resistance.

Art Unit: 1753

13. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable Yamada or Ueno in view of Ishiguro et al (USP 4,851,105).

14. This claim further differs by calling for the bonding boundary to be undulated. Ishiguro discloses a zirconia sheet bonded to an alumina-containing sheet 12 at an undulating boundary. See figure 2(b). It would have been obvious for Yamada or Ueno to adopt the undulating boundary of Ishiguro in order to strength the anchoring/bonding of a zirconia sheet to an alumina sheet, as discussed at col. 6, lines 24-41 of Ishiguro.

15. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada or Ueno in view of JP 9-26409 (hereafter "JP '409").

16. This claim further differs by calling for a difference in the coefficients of expansion of the zirconia sheet and the alumina sheet to be less than 2×10^{-6} . JP '409 discloses having that difference to be between 0 and 0.2%. See page 4, lines 7-8 of the translation. It would have been obvious for either Yamada or Ueno to adopt a virtually zero difference between these coefficients, as taught by JP '409, in order to minimize thermal stress. Both Yamada and Ueno recognized the need for minimal thermal stress. See Yamada, col. 7, lines 5-62 and Ueno, col. 5, lines 37-44.

17. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada or Ueno in view of JP 08-114571 (hereafter "JP '571").

18. This claim further differs by calling for a sintering contraction coefficient difference between a zirconia sheet and an alumina sheet to be less than 3%. Japan '571 discloses such a sintering contraction coefficient difference. See the fourth line from the bottom of the English abstract. It would have been obvious for Yamada and Ueno to adopt this sintering contraction

Art Unit: 1753

coefficient difference to minimize thermal stress. Again see Yamada, col. 7, lines 5-62 and Ueno, col. 5, lines 37-44.

Response to Arguments

19. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 5:30 A.M. to 3:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU 1753
March 30, 2005


KAJ K. OLSEN
PRIMARY EXAMINER